

1. An intermediate lens structure, comprising a block of lens material formed on a support surface, wherein cut-out portions are removed from a central part of the block of lens material.
2. The intermediate lens structure of claim 1, wherein the block of lens material comprises a spun-on polymer.
3. The intermediate lens structure of claim 2, wherein the spun-on polymer comprises a transparent photosensitive polymer.
4. A lithographic mask for forming a micro-lens from an intermediate lens structure, comprising:
 - a mask area; and
 - at least one exposure opening within the mask area adapted to form at least one cut-out portion in the intermediate lens structure.
5. The lithographic mask of claim 4, wherein the at least one exposure opening is non-symmetrical.
6. The lithographic mask of claim 4, wherein the at least one exposure opening is symmetrical.

7. A lithographic mask array for forming an array of micro-lenses from a plurality of intermediate lens structures, comprising an array of masks, each mask comprising a mask area and at least one exposure opening within the mask area adapted to form at least one cut-out portion in a respective one of the intermediate lens structures.

8. The lithographic mask array of claim 7, wherein the mask areas comprise an opaque material.

9. A lithographic mask array for forming an array of micro-lenses from a plurality of intermediate lens structures, comprising:
a plurality of mask areas formed of an opaque material; and
at least one pull-back mask portion adapted to link a pair of intermediate lens structures together to retard pull-back of the resulting micro-lenses.

10. The lithographic mask array of claim 9, wherein at least one of the mask areas includes at least one exposure opening for forming at least one cut-out portion in a respective one of the intermediate lens structures.

11. The lithographic mask array of claim 10, wherein said at least one exposure opening is symmetrical.

12. The lithographic mask array of claim 10, wherein said at least one exposure opening is non-symmetrical.

13. A method for forming a micro-lens, comprising:
coating a lens material on a support structure;
exposing a portion of the lens material;
removing unwanted portions and cut-out portions from the lens material; and
reflowing the lens material to form the micro-lens.

14. The method of claim 13, wherein said act of exposing the lens material comprises directing electromagnetic radiation through a lithographic mask at the lens material.

15. The method of claim 14, wherein the lithographic mask includes a mask area and at least one exposure opening adapted to form at least one cut-out portion in the lens material.

16. The method of claim 15, wherein the lens material comprises a transparent photosensitive polymer.

17. The method of claim 16, wherein the transparent photosensitive polymer is a positive resist wherein the electromagnetic radiation is directed through the at least one exposure opening to expose

the portion of the lens material and the exposed portion of the lens material is removed.

18. The method of claim 16, wherein the transparent photosensitive polymer is a negative resist wherein the electromagnetic radiation is directed through the at least one exposure opening to expose the portion of the lens material and an unexposed portion of the lens material is removed.

19. The method of claim 15, wherein the at least one exposure opening is non-symmetrical.

20. The method of claim 15, wherein the at least one exposure opening is symmetrical.

21. The method of claim 13, further comprising baking the lens material prior to the reflow step to recondition reflow properties of the lens material.

22. A method for forming a micro-lens array, comprising:
coating a wafer;
directing electromagnetic radiation through a lithographic mask array to expose portions of the plurality of intermediate lens structures, wherein the lithographic mask array includes a plurality of mask portions

and at least one pull-back mask portion;

removing unwanted portions from the intermediate lens structures;

and

reflowing the intermediate lens structures to form an array of micro-lenses.

23. The method of claim 22, wherein at least one mask portion includes at least one exposure opening adapted to form at least one cut-out portion in a respective one of the intermediate lens structures.

24. The method of claim 22, wherein the act of coating comprises spinning on a polymer material.

25. The method of claim 24, wherein the act of removing comprises using a developer to remove the unwanted portions of the intermediate lens structures.

26. The method of claim 24, wherein the polymer is a positive resist and the act of removing comprises removing unwanted portions of the intermediate lens structure that have been exposed.

27. The method of claim 24, wherein the polymer is a negative resist and the act of removing comprises removing unwanted portions of the intermediate lens structure that remain unexposed.

28. A method of forming a micro-lens from a material having a thickness and a surface area, comprising:

forming an intermediate lens structure on a support structure from the material;

reducing the mass of the material; and

subsequently shaping the material into the micro-lens.

29. The method of claim 28, wherein said act of shaping comprises reflowing the material.

30. A method of adjusting the focal length of a micro-lens, comprising:

coating a transparent material having a mass onto a support structure, wherein said transparent material is capable of forming a micro-lens having a first focal length upon a reflow;

reducing the mass of the transparent material; and

reflowing the transparent material to form a micro-lens having a second focal length different from the first focal length.

31. The method of claim 30, wherein said act of reducing the mass of the transparent material comprises removing a portion of said transparent material to form at least one cut-out portion.

32. A method of forming a semiconductor micro-lens, comprising:

- fabricating a support surface;
- spin coating an intermediate lens structure on the support surface;
- patterning at least one cut-out portion in the intermediate lens structure;
- developing the at least one cut-out portion; and
- shaping the intermediate lens structure into the semiconductor micro-lens.

33. The method of claim 32, wherein said act of shaping comprises reflowing the intermediate lens structure.

34. A semiconductor micro-lens formed from an intermediate structure and having a radius defined during fabrication by reducing mass from a centralized portion of the intermediate structure.